AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application. The following listing provides the amended claims with the amendments marked with deleted material crossed out and new material underlined to show the changes made.

Listing of Claims:

1.   (Currently Amended) A method of quantizing a particular macroblock of a particular frame in a sequence of digital video frames, the particular frame having a frame type information, said method comprising:

determining a buffer occupancy accumulator for the particular frame as a difference between an actual amount of bits used and a requested amount of bits for a previous frame having the same frame type as the particular frame;

limiting an amount of change in said buffer occupancy accumulator based upon the frame type properties; and

encoding said macroblock digital video information using a quantizer value computed based on said buffer occupancy accumulator.

2.   (Canceled)

3.   (Currently Amended) The method of quantizing digital video information as claimed in claim 1, wherein said limiting an amount of change in said buffer occupancy accumulator is performed by clipping said buffer occupancy accumulator.

4.   (Currently Amended) The method of quantizing digital video information as claimed in claim 1, wherein said limiting an amount of change in said buffer occupancy accumulator is performed by scaling said buffer occupancy accumulator.

5. (Currently Amended) A method of quantizing a particular macroblock of a particular frame in a sequence of digital video frames information, said method comprising:

determining a base quantizer value;

determining a quantizer adjustment based upon frame properties on a scaling function that is different for different macroblock types; and

encoding said digital video information macroblock based on a quantizer value computed as a sum of the base quantizer value and the quantizer adjustment.

6. (Canceled)

7. (Currently Amended) The method of quantizing digital video information as claimed in claim 5, wherein said quantizer adjustment the scaling function is a function of further based upon a position of the particular macroblock position within the particular frame.

8. (Currently Amended) The method of quantizing digital video information as claimed in claim 5, wherein said quantizer adjustment the scaling function is a function of bits per pixel of a current the particular frame.

9. (Currently Amended) The method of quantizing digital video information as claimed in claim 5, wherein said quantizer adjustment is further based on a difference between a number of bits actually used to encode previous macroblocks of the frame and a number of bits that should have been used to encode previous macroblocks of the frame.

10. (Currently Amended) The method of quantizing digital video information as claimed in claim 9, wherein said number of bits that should have been used is calculated in a manner that takes into account macroblock types.

11. (Currently Amended) The method of quantizing digital video information as claimed in claim 5, wherein said quantizer adjustment is further based on a Normalized Sum of Absolute Differences (NSAD).

12. (Currently Amended) The method of ~~quantizing digital video information as claimed in~~ claim 5, wherein said quantizer adjustment is further based on a macroblock activity measure normalization (mbactN).

13. (Currently Amended) The method of ~~quantizing digital video information as claimed in~~ claim 5, wherein determining a base quantizer value comprises clipping said base quantizer value to produce an adaptively determined finite range.

14. (Currently Amended) A method of determining a quantizer <u>value</u> for quantizing <u>a</u> <u>particular macroblock of a particular frame in a sequence of</u> digital video <u>frames</u> ~~information~~, said method comprising:

<u>when the particular frame is a first frame type, computing a number of bits that should</u> <u>have been used to encode all previously encoded macroblocks of the particular frame by using a</u> <u>first formula;</u>

<u>when the particular frame is a second frame type, computing the number of bits that</u> <u>should have been used to encode all previously encoded macroblocks of the particular frame by</u> <u>using a second formula;</u>

determining a delta value comprising a difference between a number of bits actually used <u>to encode all previous macroblocks of the frame</u> and [[a]] <u>the computed</u> number of bits that should have been used~~, wherein said number of bits that should have been used is dependent~~ ~~upon a frame type~~; <u>and</u>

quantizing said <u>particular macroblock</u> ~~digital video information~~ using a quantizer value computed based on said delta value.

15. (Canceled)

16. (Currently Amended) A computer readable medium storing a computer program ~~executable~~ <u>which when executed</u> by at least one processor <u>quantizes a particular macroblock of a</u>

particular frame in a sequence of digital video frames, the particular frame having a frame type, the computer program comprising sets of instructions for:

determining a buffer occupancy accumulator for the particular frame as a difference between an actual amount of bits used and a requested amount of bits for a previous frame having the same frame type as the particular frame;

limiting an amount of change in said buffer occupancy accumulator based upon the frame type ~~properties~~; and

encoding said macroblock ~~digital video information~~ using a quantizer value computed based on said buffer occupancy accumulator.

17.   (Canceled)

18.   (Currently Amended) The computer readable medium ~~as claimed in~~ of claim 16, wherein said limiting an amount of change in said buffer occupancy accumulator is performed by clipping said buffer occupancy accumulator.

19.   (Currently Amended) The computer readable medium ~~as claimed in~~ of claim 16, wherein said limiting an amount of change in said buffer occupancy accumulator is performed by scaling said buffer occupancy accumulator.

20.   (Currently Amended) A computer readable medium storing a computer program which when executed ~~executable~~ by at least one processor, ~~the computer program for implementing a video encoder~~ quantizes a particular macroblock of a particular frame in a sequence of digital video frames, the computer program comprising sets of instructions for:

determining a base quantizer value;

determining a quantizer adjustment based ~~upon frame properties~~ on a scaling function that is different for different macroblock types; and

encoding said ~~digital video information~~ macroblock based on a quantizer value computed as a sum of the base quantizer value and the quantizer adjustment.

21.   (Canceled)

22.   (Currently Amended) The computer readable medium ~~as claimed in~~ of claim 20, wherein ~~said quantizer adjustment~~ the scaling function is a function of ~~further based upon~~ a position of the particular macroblock ~~position~~ within the particular frame.

23.   (Currently Amended) The computer readable medium ~~as claimed in~~ of claim 20, wherein ~~said quantizer adjustment~~ the scaling function is a function of ~~further based~~ bits per pixel of ~~a current~~ the particular frame.

24.   (Currently Amended) The computer readable medium ~~as claimed in~~ of claim 20, wherein said quantizer adjustment is further based on ~~scaling factor multiplied by~~ a difference between a number of bits actually used to encode previous macroblocks of the frame and a number of bits that should have been used to encode previous macroblocks of the frame.

25.   (Currently Amended) The computer readable medium ~~as claimed in~~ of claim 24, wherein said number of bits that should have been used is calculated in a manner that takes into account macroblock types.

26.   (Currently Amended) The computer readable medium ~~as claimed in~~ of claim 20, wherein said quantizer adjustment is further based on a Normalized Sum of Absolute Differences (NSAD).

27.   (Currently Amended) The computer readable medium ~~as claimed in~~ of claim 20, wherein said quantizer adjustment is further based on a macroblock activity measure normalization (mbactN).

28.   (Currently Amended) The computer readable medium ~~as claimed in~~ of claim 20, wherein the ~~sets~~ set of instructions for determining a base quantizer value comprises a set of

instructions for clipping said base quantizer value to produce an adaptively determined finite range.

29. (Currently Amended) A computer readable medium storing a computer program ~~executable~~ which when executed by at least one processor~~, the computer program for determining~~ determines a quantizer value for quantizing a particular macroblock of a particular frame in a sequence of digital video frames ~~digital information~~, the computer program comprising sets of instructions for:

when the particular frame is a first frame type, computing a number of bits that should have been used to encode all previously encoded macroblocks of the particular frame by using a first formula;

when the particular frame is a second frame type, computing the number of bits that should have been used to encode all previously encoded macroblocks of the particular frame by using a second formula;

determining a delta value comprising a difference between a number of bits actually used to encode all previous macroblocks of the frame and [[a]] the computed number of bits that should have been used~~, wherein said number of bits that should have been used is dependent upon a frame type~~; and

quantizing said particular macroblock ~~digital video information~~ using a quantizer value computed based on said delta value.

30. (Canceled)

31. (Currently Amended) The computer readable medium ~~as claimed in~~ of claim 29, wherein the frame type is one of an intra-frame encoded and an inter-frame encoded.

32. (Currently Amended) The method ~~as claimed in~~ of claim [[2]]1, wherein the frame type is one of an intra-frame encoded and an inter-frame encoded.

33. (Canceled)

34. (Currently Amended) The method ~~as claimed in~~ of claim 14, wherein the frame type is one of an intra-frame encoded and an inter-frame encoded.

35. (Currently Amended) The computer readable medium ~~as claimed in~~ of claim [[17]]16, wherein the frame type is one of an intra-frame encoded and an inter-frame encoded.

36. (Canceled)

37. (New) The method of claim 1, wherein limiting the amount of change in the buffer occupancy accumulator comprises limiting the change to a particular percentage of a value of the buffer occupancy accumulator from the previous frame having the same type as the particular frame.

38. (New) The method of claim 5, wherein the macroblock type is one of intra-macroblocks and non-intra-macroblocks.

39. (New) The method of claim 9, wherein the quantizer adjustment is based upon multiplying the scaling function by (i) the difference between the number of bits actually used to encode previous macroblocks of the frame and the number of bits that should have been used to encode previous macroblocks of the frame, and (ii) a normalized activity level of the particular macroblock.

40. (New) The method of claim 14, wherein the first frame type includes motion compensated macroblocks, and the first formula is based on a normalized sum of absolute differences that allocates more bits for the frame if a motion compensated residual for the macroblocks is more complex.

41. (New) The method of claim 14, wherein the second frame type does not include motion compensated macroblocks, and the second formula is based on a normalized macroblock activity measure that allocates more bits for the frame if the macroblock activity is smaller.

42.   (New) The method of claim 14, wherein the quantizer value includes a quantizer adjustment computed by multiplying (i) the determined delta value, (ii) a scaling function that is different for different macroblock types, and (iii) a normalized activity level of the particular macroblock.